



Contribution ID: 252

Type: Poster

Pb-210 and Po-210 in Some Medicinal Plants

Tuesday, May 13, 2014 5:15 PM (1h 30m)

In recent decades, a global trend has been observed in an increased consumption of medicinal plants and herbal formulations, which makes monitoring of herbal medicines to be an actual problem as regards their pollution with heavy metals, pesticides and radionuclides [1]. The highly-toxic are long-lived decay products of U-238 Series, ^{210}Pb and ^{210}Po . In plants, which are used for making medicinal formulations, the ^{210}Po content can be as high as several tens of Bq/kg [2].

The aim of the present work was to determine specific radioactivity of ^{210}Pb and ^{210}Po in medicinal plants, which are commercially available via the network of pharmacies, and to estimate the effective radiation dose due to ^{210}Po in humans for a 30-day course of treatment with phyto-teas prepared by infusion from these herbs. ^{210}Po in samples and in aqueous extracts were determined by alpha-spectrometry. The samples were digested with a mixture of $\text{H}_2\text{O}_2 + \text{HNO}_3$ (conc.). The aqueous extracts were obtained according to the recommended procedure. ^{210}Po was quantitatively self-deposited on nickel discs, the remaining solution having been kept for 6 to 8 months for ^{210}Po to accumulate from ^{210}Pb . After that period ^{210}Po was deposited again. As a tracer to check chemical yields, a mixture of ^{208}Po and ^{209}Po was used. All data are recalculated for the time the samples were made.

Six samples were studied. They are:

1. *Quercus dalechampii* Ten.;
2. *Alpinia officinalis* L.;
3. *Ledum palustre* L.;
4. *Betula pendula* Roth;
5. *Plantago major* L.;
6. *Artemisia absinthium* L.

Specific radioactivity of ^{210}Pb was from 1.3 (*Alpinia officinalis* L.) to 18.1 (*Ledum palustre* L.) Bq/kg d.w. and that of ^{210}Po was from 94 (*Betula pendula* Roth) to 2257 (*Ledum palustre* L.) Bq/kg d.w. The $^{210}\text{Po}/^{210}\text{Pb}$ ratio in the samples under study substantially exceeds unity, which means that the origin of ^{210}Po in there is not related only to radioactive decay of ^{210}Pb . A fraction of the "unsupported" ^{210}Po is mere 0.2–5.0% of the total amount of the radionuclide, whereas the "unsupported" ^{210}Po fraction is close to 100%. Analogous results are given in [3]. The obtained data can be explained by a predominant absorption of ^{210}Po over ^{210}Pb by plants from the environment. For example, it is known that the mean value of the $^{210}\text{Po}/^{210}\text{Pb}$ ratio in air is 0.17, in atmospheric deposits, from 0.1 to 0.54, whereas in soil it is close to 1.0 [4].

The mean annual dose of radiation for the population of the Russian Federation due to ^{210}Pb , ^{210}Po , ^{228}Ra , and ^{226}Ra radionuclides in food and drinking water is estimated to be at a level of 164 $\mu\text{Sv}/\text{yr}$ [5]. The radiation exposure due to ^{210}Po , which enter the human organism with a daily consumption of 100–300 mL of medicinal plant infusions for 30 days, is from 2 to 21 μSv . It amounts from 1 to 13% of mean annual dose.

Based on the above, a conclusion is drawn on that the relative contribution of phyto-teas into the effective annual radiation dose due to Polonium-210 in humans is substantial and should be taken into account.

1. Chan K. Some aspects of toxic contaminants in herbal medicines. *Chemosphere*, 52, 2003, 1361 – 1371.
2. Desideri D. et al. Natural and artificial radioactivity of some medicinal plants. *J. Environ. Radioact.*, 101, 2010, 751 – 756.
3. Vaaramaa K. et al. Distribution of ^{210}Pb and ^{210}Po concentrations in wild berries and mushrooms in boreal forest ecosystems. *Sci. Total Environ.*, 408, 2009, 84 – 91.
4. Parfenov Y. D. Po-210 in the environment and in the human organism. *Atomic Energy Rev.*, 12, 1974, 75 – 143.
5. Commentaries to Radiation Security Norms (NRB-99-2009). Moscow, 2009 (in Russian).

Primary author: Mrs PUCHKOVA, Elena (Saint-Petersburg State University)

Co-author: Ms BOGDANOVA, Oksana (Saint-Petersburg State University)

Presenter: Dr GOMZINA, Natalia (N.P.Bekhtereva Institute of the Human Brain, Russian Academy of Sciences (IHB RAS), St. Petersburg, Russia)

Session Classification: Poster Session - Radionuclides in the Environment, Radioecology

Track Classification: Radionuclides in the Environment, Radioecology